Book reviews

BOOK REVIEW

Lehrbuch der Botanik
Textbook of Botany

Founded by E. STRASBURGER, F. NOLL, H. SCHENCK and A. F. W. SCHIMPER

36th edition, revised by ANDREAS BRESINSKY, CHRISTIAN KÖRNER, JOACHIM W. KADEREIT, GUNTHER NEUHAUS and UWE SONNEWALD.

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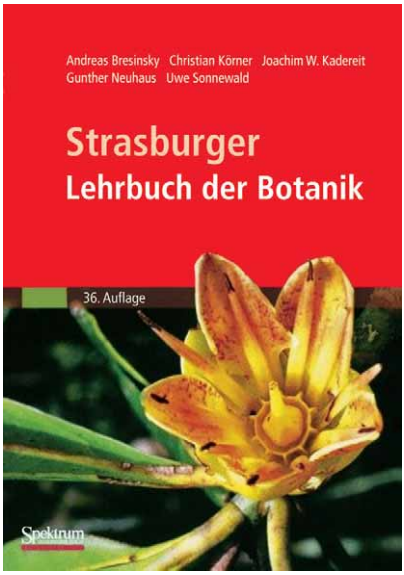

The founders of this textbook were botany *docents* at the University of Bonn (Germany). They constantly exchanged scientific insights and cooperated in their teaching activities. Their objective in publishing the first edition of the Strasburger Textbook was to share their accumulated knowledge. Eduard Strasburger wrote the introduction and the chapter on morphology, Fritz Noll the physiology part, Heinrich Schenck the cryptogams, and Andreas Franz Wilhelm Schimper the phanerogams. Although each author primarily was responsible for his part, there was still a strong cooperation provided by the ongoing contacts among the coauthors so that in spite of the plurality of authors the book with its four parts appeared as a genuine unity.

According to the preface of the first edition (1894) this textbook was intended to be used by students at high schools to advance their scientific interest, knowledge, and perceptions. At the same time the book also considered the practical aspects of botanical studies, especially in medicine and pharmacy.

For the past 116 years the importance of the Strasburger Textbook was mainly due to the well balanced and complete presentation of the diverse parts of botany as well as its currency and high scientific level. Further advances were the excellent text, its differentiation between elementary and advanced knowledge of the reader (distinguished by the type of print, normal and petit), the excellent illustrations, and an acceptable price.

Until 1991 the contents of the textbook were a little behind the actual level of scientific progress, in agreement with the generally respected rule that most recent discoveries should not be included in a textbook before they definitely are accepted to be correct.

In 1991 (33rd edition) the introduction and the morphology part were written by Peter Sitte, a new member of the team of authors. His presentation of the matter, the choice and quality of illustrations and the actuality of explanations, which considerably differed from the moderate and temperate classic style of the nearly 100 years old textbook, clearly showed that with this author the Strasburger textbook was entering a new era.

The new style of Sitte's introduction and morphology did not remain without influence on or resonance with the coauthors of the team, which became clear as soon as the 34th edition (1998) and especially in the 35th edition in which Peter Sitte and Andreas Bresinsky with three new coauthors (Elmar W. Weiler, Joachim W. Kadereit, and Christian Körner) succeeded in reaching the present level of a high quality textbook that at the same time met the requirements of handbook and reference book.

During the past 116 years of its existence the Strasburger Textbook was translated into eight foreign languages: into English (9 editions, the last in 1975!), Italian (9 editions), Polish (5), Spanish (9), Serbo-Croatian (4), Russian (1), Turkish (l) and Portuguese (in preparation).

In the recent 36th edition two new authors, Gunther Neuhaus and Uwe Sonnewald, thoroughly worked up the first and second part of the book. Sitte left the team of the authors because of his age.

The first part of the book, now »Structure« (previously termed morphology) deals with the chemical principles of life, the fundamentals of cell biology, and spreads over to the morphology of higher plants. Special attention is paid to the consequent use of the international scientific terminology in cell biology, as well as to the actualization of cell biological facts.

The first part – Structure – begins thus with the molecular principles, that is with the building components of the cells [Chapter 1] explaining the structure and basic functions of nucleic acids (their building components; structure and replication of deoxyribonucleic acid DNA; ribonucleic acids, viruses, phages, and viroids), the proteins (aminoacids as building components of proteins and protein complexes), polysaccharides (monosacharides as their building components, the formation of glycosides, further the reserve polysaccharides and the structural polysaccharides), and finally the lipids and the formation of lipid double layers in biomembranes.

In the following chapter [2] the structure and ultrastructure of the cell, the fundamental facts of cell biology, the plant cell**,** the cell structure of prokaryotes, as well as the endosymbiont theory and the hydrogen hypothesis are well presented and explained. Then the tissues of cormophytes are treated, both the formative tissues (meristems) and the permanent tissues [3]. The first part of the book is finished with a presentation of the morphology and anatomy of cormophytes [4], containing sections on shoot axis, of leaf organs (forms and metamorphoses), and of roots.

In the second part of the book, the main aspects of plant physiology are presented: metabolism, growth and development, movements and allelophysiology. In the present edition the sections concerning the primary metabolism were rewritten, and all other parts brought up to date.

This second part begins with the physiology of the metabolism [5] In this section all aspects of plant metabolism are presented and explained: energetics of metabolism, economy of minerals and water, photosynthesis (light reactions and the path of carbon, the assimila-

tion of nitrate and sulphate), the transport of assimilates, the energy earning by the degradation of carbohydrates, the formation of structural and reserve lipids and their mobilization, the formation of aminoacids, purines and pyrimidines, of tetrapyrols, and finally secondary metabolism, plant polymers and the excretion of plant substances.

In the next chapter [6] the fundamental principles of the developmental physiology are described and interpreted, as there are genetic and cellular principles of development, the systemic control of the development, and interaction of cells during the processes of development by means of phytohormones and other factors. All this is followed by the description of the many diverse kinds of movement in plants [7].

The last chapter [8] (introduced seven years ago in the 35th edition by Elmar Weiler) concerns allelophysiology in which the peculiarities of the heterototrophic nutrition, of symbiosis and pathogens, herbivory and allelopathy are fundamentally explained and discussed.

In the third part of the book, concerned with evolution and systematics, special attention is paid to the changes of our conception of the phylogeny of bacteria, fungi and plants, mainly by means of the new molecular-systematical statements. The history of vegetation has been thoroughly revised in this edition.

In the chapter on evolution [9] the variation, the pattern and the natural variation of variability, the formation of species and the macroevolution are fundamentally presented and explained.

The following chapter on systematics and phylogeny is the most extensive chapter of the book [10] – about 340 pages long, a third of the whole book. This is understandable as there are about 300,000 species of plants on Earth.

After a diligent treatment of the methods of systematics, the world of bacteria, fungi, and plants is described corresponding to the three domains (or regna) of the Bacteria, Archaea, and Eucarya (or Eucaryotes). The third regnum is divided in seven Subdomains: Acrasiobionta, Myxobionta, Mycobionta (fungi with chitin), Glaucobionta, Rhodobionta, Heterokontobionta, and Chlorobionta (»Viridiplantae«, containing two divisions: Chlorophyta and Streptophyta),

The flower plants are described under the term Spermatophytina = Seedplants, from p. 799 to p. 923. (The designation »Vierte Unterabteilung«[Fourth Subdivision, see also on p. 620!] apparently is an error). An overview of the systematics of Angiosperms is given on pp. 847 to 919 in the form of 57 »basal orders« with the data of families, each with the number of genera, species and geobotanic remarks, all located inside light brown rectangular fields, and with short but very well illustrated presentations.

The third part of the book finishes with the newly worked up history of vegetation.

In the fourth part of the book, the ecology of plants is treated in relation to life conditions at diverse locations. Plant reactions to the factors of climate and soil, the processes in the populations and species communities, as well as the great vegetation zones of Earth are explained.

In this 36th edition the global aspects of ecology are strongly pointed out. Numerous illustrations have been newly chosen or even added (about 260) and are highly impressive and very instructive due to their excellent quality and perfect reproduction in spite of their small size (21 × 30 to 50 × 70 mm). In this way the fourth part of the book in just a few pages touches on the whole contents of voluminous contemporary textbooks.

This fourth part of the book was introduced under the title »Ecology« by Christian Körner in the 35th edition (2002), while the former titles of this part were »Plant Geography« (20th–29th edition, 1939–1970, by Franz Firbas), and »Geobotany« (30th–34th edition, 1971–2002, by Friedrich Ehrendorfer).

In the present edition, ecology comprehends four chapters [11–14]. It begins with the principles of ecology [11], which are represented by the explanation of the terms limitation, fitness and optimum, stress and adaptation, the time factor and non-linear reactions, biological variation, ecosystems and their structure, and finally the main directions of plant ecological research.

The next chapter [12], »Plants in their living space«, deals with the many different factors influencing growth and distribution of plants such as light, temperature, availability of water and minerals, and also biotic interactions. At last, human influences are well interpreted.

In the »Population and Vegetation Ecology« [13] plant regions and the ecology of vegetations are described and interpreted. The last chapter [14] deals with the vegetation of Earth, especially with the vegetation of the temperate zone, and with the biomass of the Earth.

After the end of the text on p. 1120 follow a list of references (p. 1121–1124), an index (p. 1125–1171), a list of abbreviations (p. 1172–1173) and a guide to units and symbols (p. 1174–1175). Maps of the global biodiversity of vascular plants and of the vegetation of Earth are placed at the beginning and the end of the book (first and last page plus the inner side of the book's wrapper).

At the beginning of the book there are data on the book (Prefaces of the present 36th edition, as well as of the first edition; table of contents; indices of boxes and of tables, and a chronological table of important discoveries (pp. I–XVI). The book is very well organised, and by means of the corresponding indexes it is possible to find quickly any desired part of the text and corresponding illustrations. The book is excellently printed. The beautiful colour photograph on the title cover shows the flower of *Strasburgeria robusta* Guill. (Strasburgeriaceae), an endemic plant from New Caledonia, called after the founder of this textbook. In the preface of the 36th edition the authors point out that the permanent challenges for updating as well as other circumstances have been carefully considered. Among other things they ask themselves whether the title »Strasburger-Textbook of Botany« does not imply too much of an antiquated tradition that is now no longer justified with regard to the new goals, methods, results and finally even to the position of the discipline itself. Would not perhaps the term Plant Sciences (Pflanzenwissenschaften) instead of Botany correspond to a better understanding of the discipline? The decision to retain the old title was done finally by anchoring in the Strasburger tradition which permits the treatment of bacteria and fungi together with plants.

Considering this dilemma of the Strasburger authors we may perhaps try to help them with the proposal that the term Botany should be a bit modified for the Strasburger textbook by widening its sense in the way that Botany should mean the Science of Growth (in German: Lehre von den Gewächsen), corresponding to the Slavic languages in which the term for the plants (raslina, raslinje, rašće, rastlina, roslina, rastenie etc.) is derived from the verb rasti = to grow (in German: wachsen), from which there exists in German the well known and commonly used word »die Gewächse«. It should also be pointed out that in the

Strasburger Textbook the first botanical text in our history by Theophrastos Ereisios (371–286) is cited as *Die Naturgeschichte der Gewächse*. If we accept this widening of the term Botany, then we may define the term *die Gewächse* as concerning organisms which manifest their life activities mainly by growth. From the term »animals« the term *Gewächse* is well separated by the meaning of the word itself. According to the fact that in all our European languages the bacteria, archaea, cyanobacteria, all algae, fungi (mushrooms), lichens, and all plants grow somewhere on adequate substrates the idea, to unite them all under the same common term *Gewächse* appears as a reasonable solution.

Accepting this solution we cause minimal trouble in the terminology by simply inconsiderably widening the sense of the term Botany to get a proper scientific term for a conception already universally used during history in all languages and their vernaculars.

However, regardless of these terminological problems, there can be no doubt that the recent 36th edition of the Strasburger Textbook has reached the level of an excellent textbook for advanced students as well as a handbook for all whose activities are connected with any field of botany. It would therefore be an irreparable fault not to continue with further editions of this unique text. An edition of an English version would doubtlessly be welcomed on the global level.

Such an excellent, highly informative and instructive textbook will well serve not only students, but also docents, as well as scientists and experts of all branches as a reliable reference book. In fact, presumably the 36th edition of the Strasburger Textbook of Botany will soon be on the desks of many students of biology in the German speaking part of Europe as well as abroad.

Zvonimir Devidé